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AMS Tracker Thermal Control Subsystem

TTCB functional check vibration procedure

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Document change log

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Summary

This document describes the functional test of the TTCB before and after the vibration test, the complete assembled component box of the TTCS.

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(29 pages in total)

1 Scope of the document

The procedure in this document describes the functional test fore and after the vibration test of the TTCS component box, TTCB. This functional tests will be executed before and after the vibration test of the TTCB to verify no degradation regarding fixation of sensors, fixation of heaters and internal cabling.

2 References documents

	Title	Number	Date
RD-1			

3 Description of the item under test

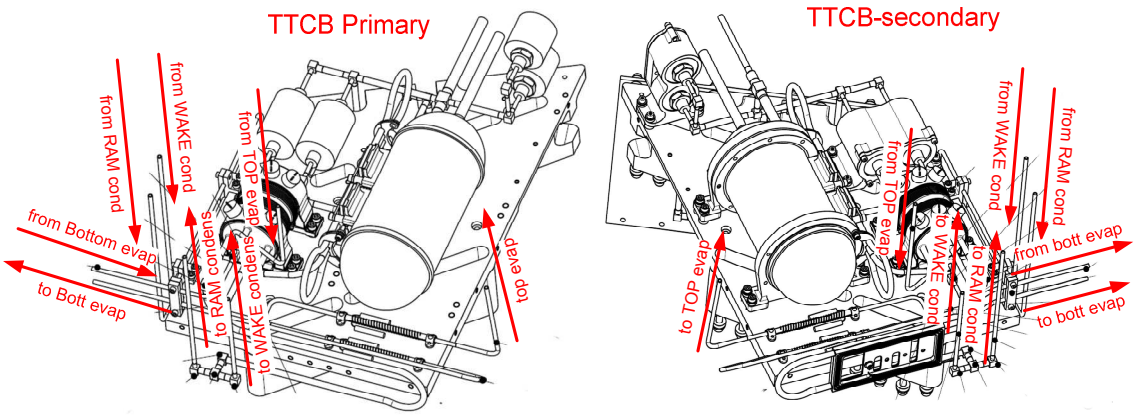

Figure 3-1: TTCB without additional tubing for He leak test

For the pre/post vibration functional check additional tubing must be used for connecting the TTCB inlet and outlet tubes in such way the TTCB can be operated. The evaporator tubes will be short circuit and the tubes to and from the radiator will connected to a small loop

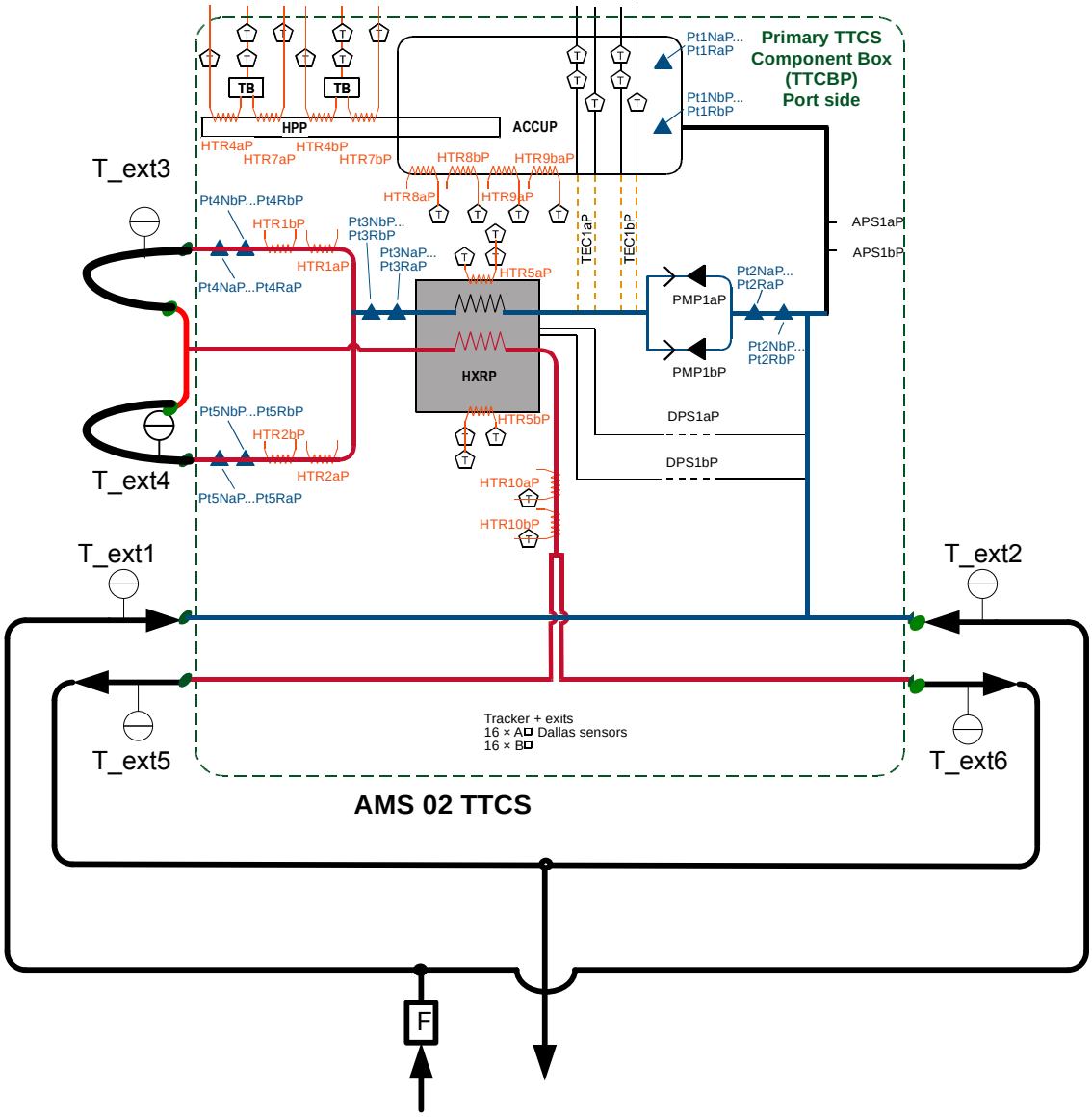

Figure 3-2: TTCB schematic with additional tubing for functional test

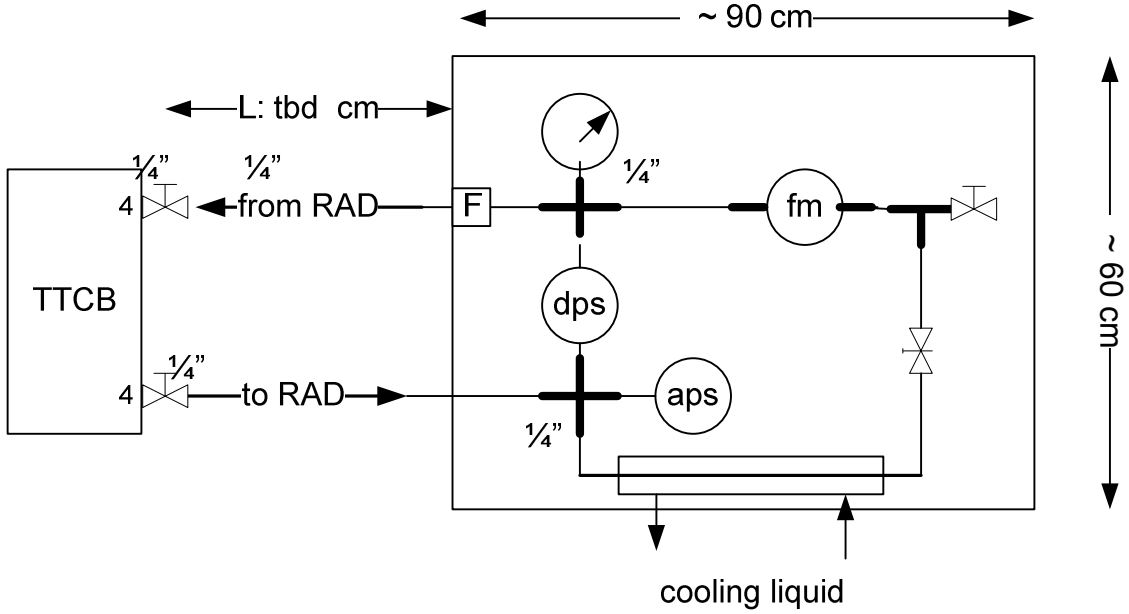

Figure 3-3: Test set-up schematic

4 Functional check description

The TTCB pre/post vibration check is executed for verifying no degradation with respect to mounting of Tsensors and heaters due to vibration test has occurred. Verification will be done by measuring the T response when a heater is witched on. Also pumps and DPS's will be checked by running the pumps on several RPM settings and reading DPS's the mass flow and a DPS-ref. The APS will be checked by reading the APS at different accumulator temperatures.

4.1 TTCB pre/post vibration functional check procedure

	TTCB functional check procedure sheet (Check with TTCE A side)	company:	date:
	Fill in by hand.	engineer:	location:

Step	Action	Monitoring	Value	**Pre-vib result**	**Post-vib result**	Comment	√
1.	Turn on TTCE with A side and read the voltage and current value	V, I	28 ± 0.1V, 0.36± 0.01A				
2.	Read all T and P sensors	T, P	Tenv± 1°C Psat				
3.	Run the climate chamber at 5°C		5 ± 1°C				
Loop Start-up							
4.	Enable automatic accumulator control by using FAC_a (HTR4a & HTR7a) and then set the set-point to 5°C						
5.	Read Pt01, Pt03, APS, and DS05 -08	Pt01 Pt03 APS DS05 DS06 DS07 DS08					
6.	When the subcooling of 5 ± 1°C is reached, run the pump at 5000 ± 500rpm,	Pt1-Pt2	ΔT > 5°	T_ext1/2	T_ext1/2		

	TTCB functional check procedure sheet (Check with TTCE A side)	company:	date:
	Fill in by hand.	engineer:	location:

Step	Action	Monitoring	Value	**Pre-vib result**	**Post-vib result**	Comment	√
7.	Read the pump speed and mass flow when it becomes stable	rmp	5000 mf [g/s]				
8.	Read the pump control voltage	V					
9.	Read DPS, DS01, DS03, DS04, DS10-DS14	DPS DS01 DS03 DS04 DS10 DS11 DS12 DS13 DS14					
Heating/Cooling Accumulator							
10.	Check if the accumulator temperature is stable at 10 ± 1°C	Pt01	10 ± 1°C				
11.	Disable automatic accumulator control						
12.	Read the power supply output	V & I					
13.	Turn on TEC_a with 40% of full power and record time	time					
14.	Read the power supply output.	V & I					

	TTCB functional check procedure sheet (Check with TTCE A side)	company:	date:
	Fill in by hand.	engineer:	location:

Step	Action	Monitoring	Value	**Pre-vib result**	**Post-vib result**	Comment	√
	Calculate power consumption of TEC_a	V*ΔI					
15.	Turn off TEC_a when the accumulator temperature reach 5±1°C and read the accumulator temperature and record time	Pt1 time	5±1°C				
16.	Write down the maximum cooling rate	ΔT/min					
17.	Read the power supply output	V & I					
18.	Turn on GAC_a (HTR8a) with 90% of full power and record time	time					
19.	Read the power supply output. Calculate resistance and power consumption of GAC_a	V & I R = V/ ΔI P = V*ΔI	 20.9±2Ω 40 W				
20.	Turn off GAC_a when the accumulator temperature 10 ± 1°C and read the accumulator temperature and record time	Pt01 Time	10±1°C				
21.	Write down the maximum heating rate	ΔT/min					
22.	Read the power supply output	V & I					
23.	Turn on TEC_a with 40% of full power and record the time	time					
24.	Read the power supply output	V & I					

	TTCB functional check procedure sheet (Check with TTCE A side)	company:	date:
	Fill in by hand.	engineer:	location:

Step	Action	Monitoring	Value	**Pre-vib result**	**Post-vib result**	Comment	√
	Read the power consumption of TEC_a	V*ΔI					
25.	Turn off TEC_a when the accumulator temperature reach 5±1°C and read the accumulator temperature and record time	Pt01 time	5±1°C				
26.	Write down the maximum cooling rate	ΔT/min					
27.	Read the power supply output	V & I					
28.	Turn on FAC_a with 90% of full power and record the time	time					
29.	Read the power supply output Calculate resistance and power consumption of FAC_a	V & I R = V/ ΔI P = V*ΔI	 20.9±2Ω 40W				
30.	Turn off FAC_a when the accumulator temperature 10 ± 1°C and read the accumulator temperature and record time	Pt01 time	10±1°C				
31.	Write down the maximum heating rate	ΔT/min					
32.	Enable automatic accumulator control and set the set-point to 5°C and wait until the accumulator temperature becomes stable						
Turn on/off Start-up Heater							

	TTCB functional check procedure sheet (Check with TTCE A side)	company:	date:
	Fill in by hand.	engineer:	location:

Step	Action	Monitoring	Value	**Pre-vib result**	**Post-vib result**	Comment	√
33.	Read the power supply output	V & I					
34.	Read Dallas sensors and record the time	DS11 DS13 DS14 time					
35.	Turn on the start-up heater SUP_a (HTR5a) and run for 5 minutes or DS11 temperature increase 8°C			T_ext1/2	T_ext1/2		
36.	Read the power supply output Calculate resistance and the power consumption of SUP_a	V & I R = V/ ΔI P= V*ΔI	 14±2 Ω 50W				
37.	Read Dallas sensors and record the time	DS11 DS13 DS14 time					
38.	Write down the temperature DS11 increasing rate	ΔT/min					
39.	Turn off the start-up heater SUP_a (HTR5a)						
Turn on/off Pre-heater							
40.	Read the power supply output	V & I					
41.	Read the temperature sensor and time	Pt04					

	TTCB functional check procedure sheet (Check with TTCE A side)	company:	date:
	Fill in by hand.	engineer:	location:

Step	Action	Monitoring	Value	**Pre-vib result**	**Post-vib result**	Comment	√
		time					
42.	Turn on the pre-heater PT1_a (HTR1a) and run for 5 minutes or the pt04 temperature increase 3°C			T_ext1/2	T_ext1/2		
43.	Read the power supply output Calculate resistance and the power consumption of PR1_a Read Pt04 Record time	V & I R = V/ ΔI P= V*ΔI Pt04 time	87±5 Ω 8W				
44.	Write down the temperature DS11 increasing rate	ΔT/min					
45.	Turn off PR1_a (HTR1a) and run for 5 minutes						
46.	Read Pt05 and time	Pt05 time					
47.	Turn on the pre-heater PR2_a (HTR2a)and run for 5 minutes or the pt05 temperature increase 3°C			T_ext1/2	T_ext1/2		
48.	Read the power supply output Calculate resistance and the power consumption of PR2_a Read Pt05 Record the time	V & I R = V/ ΔI P= V*ΔI Pt05 time	87±5 Ω 8W				

	TTCB functional check procedure sheet (Check with TTCE A side)	company:	date:
	Fill in by hand.	engineer:	location:

Step	Action	Monitoring	Value	**Pre-vib result**	**Post-vib result**	Comment	√
49.	Write down the temperature DS11 increasing rate	ΔT/min					
50.	Turn off the pre-heater PR2_a (HTR2a) and run for 5 minutes						
Turn on/off Cold Orbit Heater							
51.	Read the power supply output	V & I					
52.	Read the temperature sensor and time	T_ext5/6 time					
53.	Turn on the cold orbit heater COR_a (HTR10a) and run for 5 minutes or temperature T_ext5/T_ext6 increase 8 ^{o}C			T_ext1/2	T_ext1/2		
54.	Read the power supply output Calculate resistance and the power consumption of COR_a (HTR10a) Read the temperature sensor and time	V & I R = V/ ΔI P= V*ΔI T_ext5/T_ext6 time	13.7±2 Ω 60W				
55.	Write down the temperature increasing rate	ΔT/min					
56.	Turn off the cold orbit heater COR_a (HTR10a) and run for 5 minutes						
Change Pump Speed							

	TTCB functional check procedure sheet (Check with TTCE A side)	company:	date:
	Fill in by hand.	engineer:	location:

Step	Action	Monitoring	Value	**Pre-vib result**	**Post-vib result**	Comment	√
57.	Change the pump speed to 3000±500 rmp and run for 5 minutes						
58.	Read DPS, Pump control voltage, and flow rate	DPS rmp FR					
59.	Change the pump seep to 5000±500 rmp and run for 5 minutes						
60.	Read DPS, Pump control voltage, and flow rate	DPS rmp FR					
61.	Change the pump seep to 7500±500 rmp and run for 5 minutes						
62.	Read DPS, Pump control voltage, and flow rate	DPS rmp FR					
63.	Change the pump seep to 10000±500 rmp and run for 5 minutes						
64.	Read DPS, Pump control voltage, and flow rate	DPS rmp					

	TTCB functional check procedure sheet (Check with TTCE A side)	company:	date:
	Fill in by hand.	engineer:	location:

Step	Action	Monitoring	Value	**Pre-vib result**	**Post-vib result**	Comment	√
		FR					
65.	Change the pump seep to 5000±500 rmp and run for 5 minutes						
66.	Read DPS, Pump control voltage, and flow rate	DPS rmp FR					
67.	Turn off the pump P_a						
68.	Shut down the accumulator temperature control						
69.	Turn off the TTCE_A and go to **Check with TTCE B**						

	TTCS Box functional check procedure sheet (Check with TTCE B side)		company:			date:	
	Fill in by hand.		engineer:			location:	
Step	Action	Monitoring	Value	**Pre-vib result**	**Post-vib result**	Comment	√
1.	Turn on TTCE with B side and read the voltage and current value	V, I					
2.	Read all T and P sensor	T, P	°C				

	TTCS Box functional check procedure sheet (Check with TTCE B side)			company:		date:	
	Fill in by hand.			engineer:		location:	
Step	Action	Monitoring	Value	**Pre-vib result**	**Post-vib result**	Comment	√
3.	Run the climate chamber at 5°C						
4.	Read the power supply output	V & I					
Loop Start-up							
5.	Enable automatic accumulator control by using FAC_b (HTR4b & HTR7b) and then set the set-point to 10°C						
6.	Read Pt01, Pt03, APS, and DS05-08	Pt01 Pt02 Pt03 APS DS05 DS06 DS07 DS08					
7.	When the subcooling of 5±1°C is reached, run the pump at 5000±500rpm	Pt01-Pt02					
8.	Read the pump speed when it becomes stable	rmp					
9.	Read the pump control voltage	V					
10.	Read DPS, DS01, DS03, DS04, DS10-DS14	DPS					

	TTCS Box functional check procedure sheet (Check with TTCE B side)			company:		date:	
	Fill in by hand.			engineer:		location:	
Step	Action	Monitoring	Value	**Pre-vib result**	**Post-vib result**	Comment	√
		DS01 DS03 DS04 DS10 DS11 DS12 DS13 DS14					
11.	Read flow rate	FR					
Heating/Cooling Accumulator							
12.	Check if the accumulator temperature is stable at 10±1°C						
13.	Disable automatic accumulator control						
14.	Read the power supply output	V & I					
15.	Turn on TEC_b with 40% of full power and record the time	time					
16.	Read the power supply output	V & I					
17.	Calculate the power consumption of TEC_b	P=V*□I					

	TTCS Box functional check procedure sheet (Check with TTCE B side)			company:		date:	
	Fill in by hand.			engineer:		location:	
Step	Action	Monitoring	Value	**Pre-vib result**	**Post-vib result**	Comment	√
18.	Turn off TEC_b when the accumulator temperature reach 5±1°C and read the accumulator temperature and record the time	Pt01 time	5±1°C				
19.	Write down the maximum cooling rate	□T/min					
20.	Read the power supply output	V & I					
21.	Turn on GAC_b with 90% of full power and record the time	time					
22.	Read the power supply output	V & I					
23.	Calculate the resistance and power consumption of GAC_b	R=V/□I P=V*□I	20.9±2Ω 40 W				
24.	Turn off GAC_b when the accumulator temperature 10±1°C and read the accumulator temperature and record the time	Pt01 time	10±1°C				
25.	Write down the maximum heating rate	□T/min					
26.	Read the power supply output	V & I					
27.	Turn on TEC_b with 40% of full power and record the time	time					
	Read the power supply output	V & I					

	TTCS Box functional check procedure sheet (Check with TTCE B side)			company:		date:	
	Fill in by hand.			engineer:		location:	
Step	Action	Monitoring	Value	**Pre-vib result**	**Post-vib result**	Comment	√
	Caculate the power consumption of TEC_b	P=V*□I					
28.	Turn off TEC_b when the accumulator temperature reach 5±1°C and read the accumulator temperature and record the time	Pt01 time	5±1°C				
29.	Write down the maximum cooling rate	K/min					
30.	Read the power supply output	V & I					
31.	Turn on FAC_b with 90% of full power and record the time	time					
32.	Read the power supply output Calculate the power consumption of FAC_b	V & I P=V*□I	 40 W				
33.	Turn off FAC_b when the accumulator temperature 10±1°C and read the accumulator temperature and record the time	Pt01 time	10±1°C				
34.	Write down the maximum heating rate	K/min					
35.	Enable automatic accumulator control and set the set-point to 5°C and wait until the accumulator temperature becomes stable						

Turn on/off Start-up Heater

	TTCS Box functional check procedure sheet (Check with TTCE B side)			company:		date:	
	Fill in by hand.			engineer:		location:	
Step	Action	Monitoring	Value	**Pre-vib result**	**Post-vib result**	Comment	√
36.	Read the power supply output	V & I					
37.	Read Dallas sensors and record the time	DS11 DS13 DS14 time					
38.	Turn on the start-up heater SUP_b (HTR5b) and run for 5 minutes or DS11 temperature increase 8°C			T_ext1/2	T_ext1/2		
39.	Read the power supply output Calculate resistance and the power consumption of SUP_b	V & I R = V/ ΔI P= V*ΔI	 14±2 Ω 50W				
40.	Read Dallas sensors and record the time	DS11 DS13 DS14 time					
41.	Write down the temperature DS11 increasing rate	ΔT/min					
42.	Turn off the start-up heater SUP_b (HTR5b)						

Turn on/off Pre-heater

	TTCS Box functional check procedure sheet (Check with TTCE B side)			company:		date:	
	Fill in by hand.			engineer:		location:	
Step	Action	Monitoring	Value	**Pre-vib result**	**Post-vib result**	Comment	√
43.	Read the power supply output	V & I					
44.	Read the temperature sensor and time	Pt04 time					
45.	Turn on the pre-heater PT1_b (HTR1b) and run for 5 minutes or the pt04 temperature increase 8°C			T_ext1/2	T_ext1/2		
46.	Read the power supply output Calculate resistance and the power consumption of PR1_b Read Pt04 Record time	V & I R = V/ ΔI P= V*ΔI Pt04 time	87±5 Ω 8W				
47.	Write down the temperature DS11 increasing rate	ΔT/min					
48.	Turn off PR1_b (HTR1b) and run for 5 minutes						
49.	Read Pt05 and time	Pt05 time					
50.	Turn on the pre-heater PR2_a and run for 5 minutes or the pt05 temperature increase 8°C			T_ext1/2	T_ext1/2		
51.	Read the power supply output Calculate resistance and the power consumption of PR2_b	V & I R = V/ ΔI	87±5 Ω				

	TTCS Box functional check procedure sheet (Check with TTCE B side)			company:		date:	
	Fill in by hand.			engineer:		location:	
Step	Action	Monitoring	Value	**Pre-vib result**	**Post-vib result**	Comment	√
	Read Pt05 Record the time	P= V*ΔI Pt05 time	8W				
52.	Write down the temperature DS11 increasing rate	ΔT/min					
53.	Turn off the pre-heater PR2_b (HTR2b) and run for 5 minutes						
Turn on/off Cold Orbit Heater							
54.	Read the power supply output	V & I					
55.	Read the temperature sensor and time	T_ext5/T_ext6 time					
56.	Turn on the cold orbit heater COR_b (HTR10b) and run for 5 minutes or temperature T_ext5/T_ext6 increase 8 °C			T_ext1/2	T_ext1/2		
57.	Read the power supply output Calculate resistance and the power consumption of COR_b (HTR10b) Read the temperature sensor and time	V & I R = V/ ΔI P= V*ΔI T_ext5/T_ext6 time	13.7±2 Ω 60W				
58.	Write down the temperature increasing rate	ΔT/min					

	TTCS Box functional check procedure sheet (Check with TTCE B side)			company:		date:	
	Fill in by hand.			engineer:		location:	
Step	Action	Monitoring	Value	**Pre-vib result**	**Post-vib result**	Comment	√
59.	Turn off the cold orbit heater COR_b (HTR10b) and run for 5 minutes						
Change Pump Speed							
60.	Change the pump speed to 3000±500 rmp and run for 5 minutes						
61.	Read DPS, Pump control voltage, and flow rate	DPS rmp FR					
62.	Change the pump seep to 5000±500 rmp and run for 5 minutes						
63.	Read DPS, Pump control voltage, and flow rate	DPS rmp FR					
64.	Change the pump seep to 7500±500 rmp and run for 5 minutes						
65.	Read DPS, Pump control voltage, and flow rate	DPS rmp FR					

	TTCS Box functional check procedure sheet (Check with TTCE B side)			company:		date:	
	Fill in by hand.			engineer:		location:	
Step	Action	Monitoring	Value	**Pre-vib result**	**Post-vib result**	Comment	√
66.	Change the pump seep to 10000±500 rmp and run for 5 minutes						
67.	Read DPS, Pump control voltage, and flow rate	DPS rmp FR					
68.	Change the pump seep to 5000±500 rmp and run for 5 minutes						
69.	Read DPS, Pump control voltage, and flow rate	DPS rmp FR					
70.	Turn off the pump P_b						
71.	Shut down the accumulator temperature control						
72.	Change the climate chamber to 15°C						
73.	Turn off the DAQ system and TTCE after the temperature and pressure become stable						
74.	Backup the data						

END OF DOCUMENT